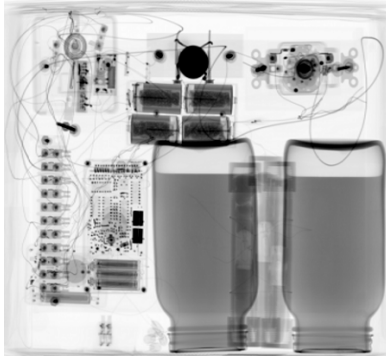


# DRCT Laboratory

## X-Ray Imaging of IED's

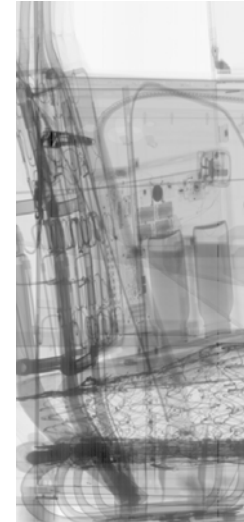
There is a need to develop a more robust transmission x-ray imaging capability to better equip first responders encountering improvised explosive devices (IEDs). X-ray imaging systems that are lightweight, portable, and offer high-quality images for a wide variety of object sizes, densities, and imaging environments are necessary. There is an additional need to improve visualization and understanding of x-ray images from field portable systems. Other objects often clutter the images and in many cases the optimal imaging geometry is not possible. Multiple radiographs of an object may be necessary for adequate interrogation, and improved visualization of these images is necessary. This work addresses both the need for improved systems and improved visualization.



Radiograph of surrogate IED. This image was collected with a system similar to a airport x-ray machine and should be used for image-quality comparison with other systems.



Surrogate automobile used to test imaging processing for portable IED inspection system. The IED is on the passenger seat.



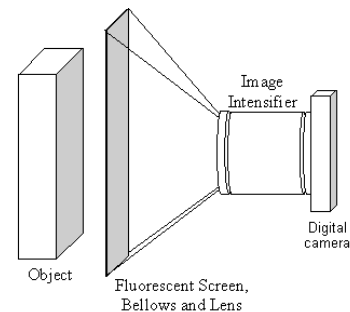
Clutter from other objects in the environment will hamper the evaluation of radiographs in field situations. Multiple views, stereo visualization, and clutter-reduction processing (CRP) will help the field operator to interpret radiographs.



A modular, field-portable x-ray imaging system could consist of an x-ray source, a phosphor screen to convert x-rays to light, an image intensifier, and an off-the-shelf digital camera. The camera could capture still images or short bursts of a sequence (real-time radiography). The prototype system shown in the photograph was used to collect images of a surrogate IED. A field portable system, shown in schematic to the right, would have interchangeable cameras depending on the imaging scenario, and phosphor screens of differing sizes depending on the object size. The imaging system could be easily optimized for any imaging situation.



Source



Radiograph of surrogate IED collected with the laboratory prototype of a modular, field portable IED inspection system. Trade offs in image size, spatial resolution, and contrast will have to be made in order to optimize a field-portable system. A modular design would allow the widest variety of objects to be imaged.

The goal of this project is to enhance the x-ray imaging capability of field radiography by developing a new imaging device and by developing an image visualization/analysis capability that may be applied to a variety of existing x-ray imaging systems. We intend to develop a low-cost modular x-ray imaging toolbox that will allow imaging of objects over a large range of sizes. The system will acquire multiple images in a short "movie mode", or static images with higher spatial resolution and dynamic range. We will also develop a suite of image visualization tools for improved localization of items of interest in an object, including: stereo image viewing and analysis; 3-D reconstruction from two or more views of an object; and novel display modalities (including fast rendering) of 2-D and 3-D images to enhance image analysis and object classification.